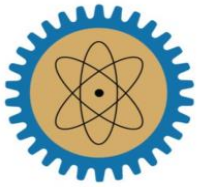

FACULTY OF ENGINEERING

DEPARTMENT OF MINING ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN AND CONTRUCTION OF A MODIFIED FUME EXTRACTOR FOR SMALE-SCALE MINERS

By:

ERIMA SWIZEN OGENA

This Thesis is submitted to the Faculty of Engineering in Partial Fulfilment of the Requirement for the Award of the Degree of Bachelor of Mining Engineering of Busitema University.

JANUARY 2022

Abstract

This review is a summary of different aspects of the design and fabrication of a modified fume extractor. It covers different fume extractor designs and materials used for construction, applications of the fume extractors and the social and environmental effects of the fumes.

Fume extractors are the devices, which clean the air in surroundings from the unwanted and undesired particles from air. These have multiple uses in multiple fields. Consider living in an environment with consistent fumes tendering from all the sides residing in the lungs not knowingly, about their type and components that they are made up of. Almost all of the industries operating today are in dire need of of fume extractors not only for the safety of their employees but also for the EPA standards set by the governments(Mohamed and Abdelakher, 2021).

The industrial sector has developed fume extraction systems to address the issue of air pollution because the EPA demands good air quality. The portable/mobile fume extraction system, stand-mounted fume extractors, and wall-mounted or fixed fume extraction systems are some examples of these systems. However, these fume extractors frequently operate ineffectively because the majority of them have an angle of 90^0, which means that many fumes will still be present in the surrounding area.

The modified fume extraction system is an enclosed system which would be able to catch maximum amount of fume and dust particles that are generated during the steel wool acid digestion process.

Declaration

I hereby declare that the content in this project report is my original work from intensive research, practical, consultation and all references made to the works of other persons have been duly acknowledged therefore it has never been submitted to any university or institution for any award to the best of our knowledge.

ERIMA SWIZEN OGENA BU/UG/2018/2113

Signature..... Date 16th/01/2023

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Approval

This is to certify this work was carried out under strict supervision and has been approved for submission to the department of Water and Mining Engineering Busitema University in the partial fulfilment of the requirement of the award of the bachelor of Science in Mining Engineering

SUPERVISORS

16/01/23

Dr Ddumba Joseph Lwanyaga

16/01/2023

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Dedication

To my parents and my uncle Dr. Leti Michael Natal, who through their financial and moral support were the source of motivation and the support to attaining my education, I dedicate this project.

Acknowledgement

I am overwhelmingly thankful to the almighty God for his abundant provision and the love for me all through the years of our life. My sincere appreciation goes towards our supervisors, Dr Ddumba Joseph Lwanga and Mr. Nwareba Edison and for the guidance, assistance advice you gave us towards the completion of this work. Finally, my heartfelt thanks go to my family and friends for the financial, spiritual and moral support they rendered to me during this period of doing this work. May God reward them abundantly!

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ACRONYMS

ASGM – Artisanal Small-scale Gold Miners

EPA – Environmental Protection Agency

WHO – World Health Organization

UNEP – Uganda National Environment Protection

PM – Pollutant Measured

HCS – Hazard Communication Standard

NCDs – Non communicable Diseases

OHSA – Occupational Safety and Health Administration

1 CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Fume extractors are the devices, which clean the air in surroundings from the unwanted and undesired particles from air. These have multiple uses in multiple fields. Consider living in an environment with consistent fumes tendering from all the sides residing in the lungs not knowingly, about their type and components that they are made up of. Almost all of the industries operating today are in dire need of of fume extractors not only for the safety of their employees but also for the EPA standards set by the governments(Mohamed and Abdelakher, 2021).

The typical particle size, which is roughly 10 microns, can enter the human body and lungs, posing serious health risks, according to the WHO. Clean air is a fundamental human right. Air pollution is the biggest environmental health issue and a major contributor to non-communicable diseases (NCDs) like heart attacks and stroke; therefore, it still poses a serious threat to people all over the world. According to the World Health Organization, there are 7 million premature deaths every year due to the combined effects of industrial and household air pollution– with millions more people falling ill from breathing polluted air. More than half of these deaths are recorded in developing countries(WHO, 2021).

In Uganda, an estimated 18,000 premature deaths every year occur due to air pollution caused by emission of poor quality air to the environment(UNEP, 2017).

Air pollutants measured include $PM_{2.5}$ and PM_{10} (particles with an aerodynamic diameter of equal or less than 2.5, also called fine, and 10 micrometre respectively), ozone (O_3), nitrogen dioxide (NO2), carbon monoxide (CO) and sulfur dioxide (SO2)(*WHO*, 2021).

The industrial sector has developed fume extraction systems to address the issue of air pollution because the EPA demands good air quality. The portable/mobile fume extraction

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